



Armed Forces College of Medicine AFCM



Tibiofibular, Ankle joint and Arches of foot

INTENDED LEARNING OBJECTIVES (ILO)



By the end of this lecture the student will be able to:

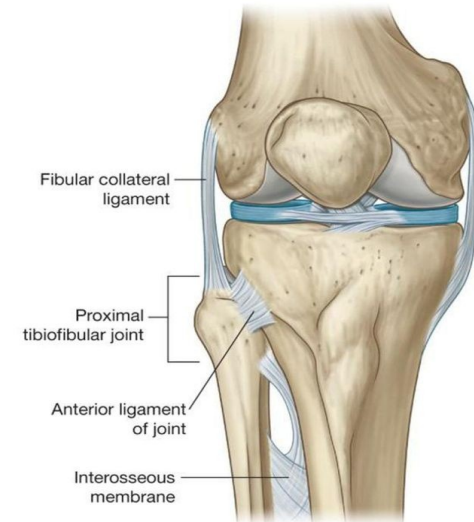
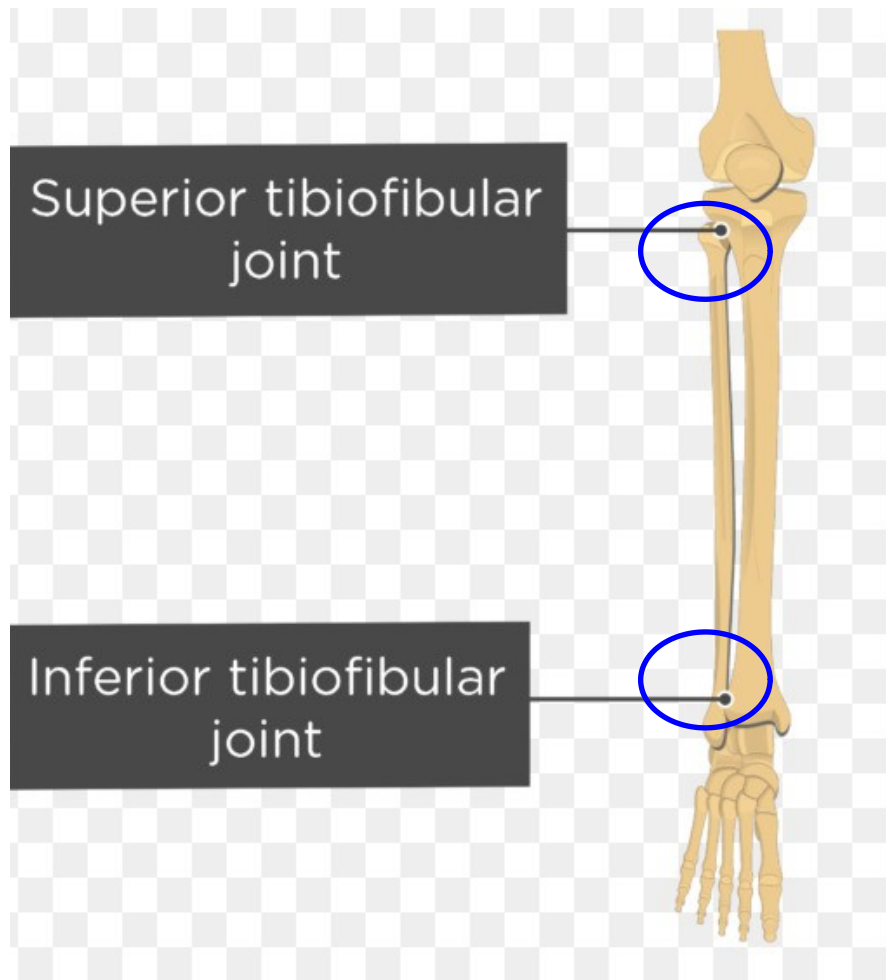
1. Describe type, articular surfaces, fibrous capsule, ligaments, movements, arterial and nerve supply of tibiofibular joints
2. Describe type, articular surfaces, fibrous capsule, synovial membrane, ligaments, movements, arterial and nerve supply of ankle joint
3. Enumerate types , bones forming, factors supporting arches of foot
4. Describe functions of arches of the foot

Lecture Plan

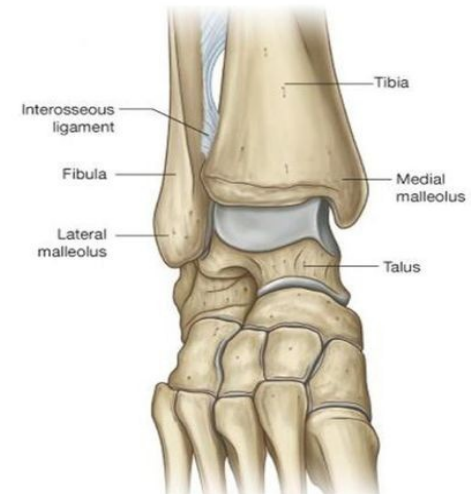


1. Part 1: **Tibiofibular Joints**
2. Part 2 : **Ankle Joint**
3. Part 3 : **Archs of foot**
4. Summary
5. Lecture Quiz (5 min)

TIBIOFIBULAR JOINTS



35



Proximal Tibiofibular Joint

Type of joint:

It is a **plane synovial** joint

Gliding movement

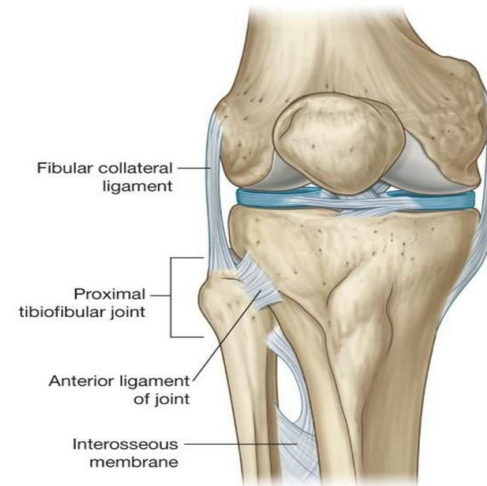
Articulating Surfaces

It is formed by an articulation between

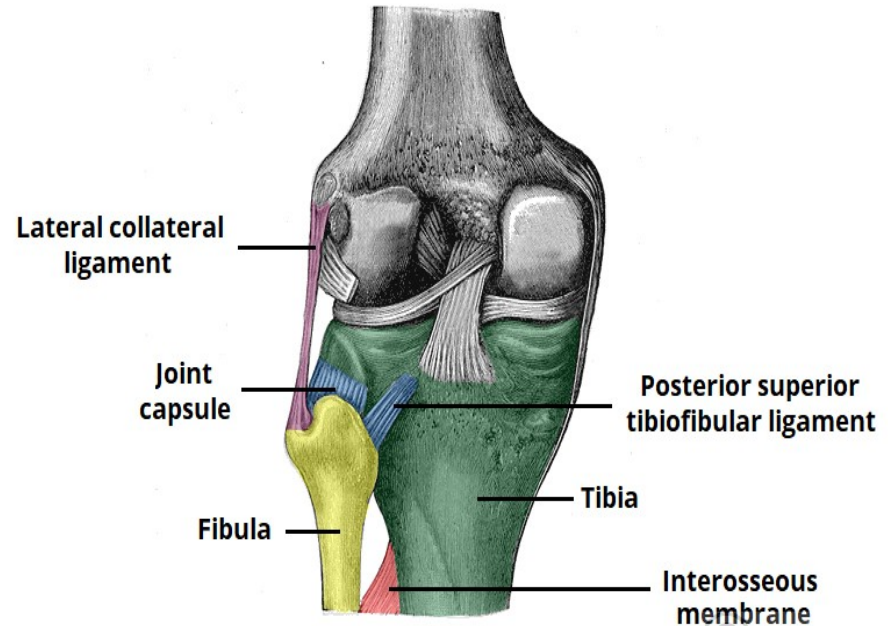
- head of the fibula
- lateral condyle of the tibia.

Supporting Structures

1. superior tibiofibular ligaments (Anterior and



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Inferior = Distal Tibiofibular Joint

□ Type of joint:

It is a **fibrous joint** =
Syndesmosis

bound by tough, fibrous tissue.

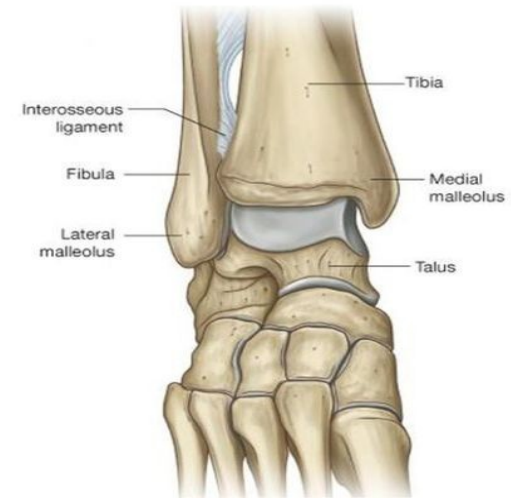
□ Articulating Surfaces

It is formed by an articulation between fibular notch of the **distal tibia** and the **fibula**

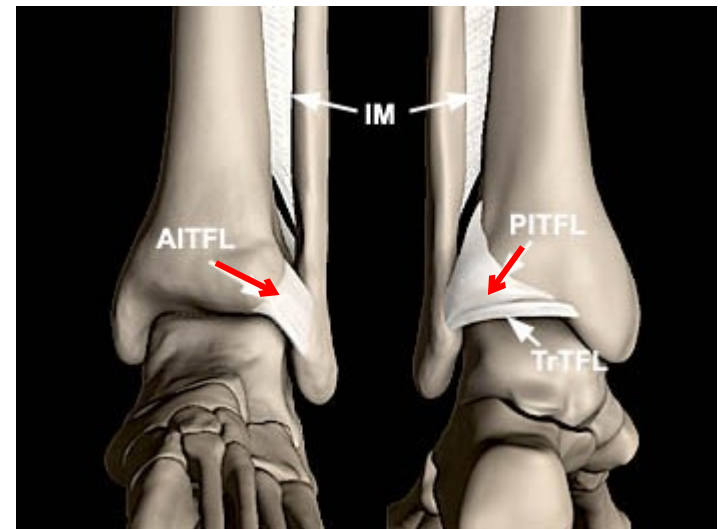
□ Supporting Structures

1. Inferior Tibiofibular Ligs.

(Anterior and posterior)



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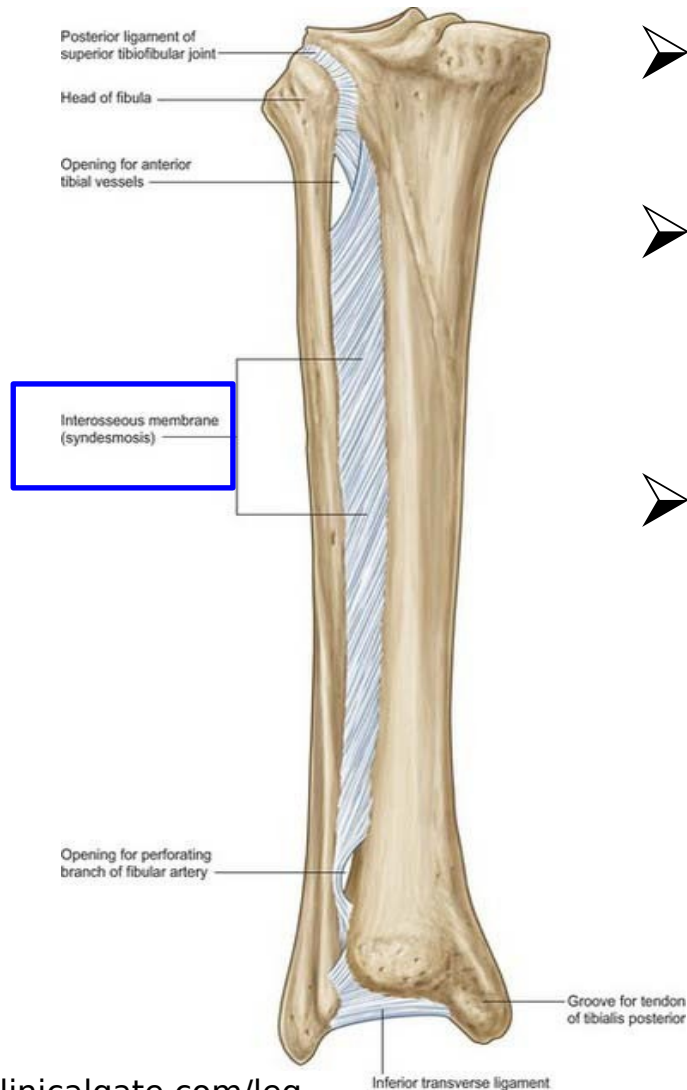


TIBIOFIBULAR JOINTS



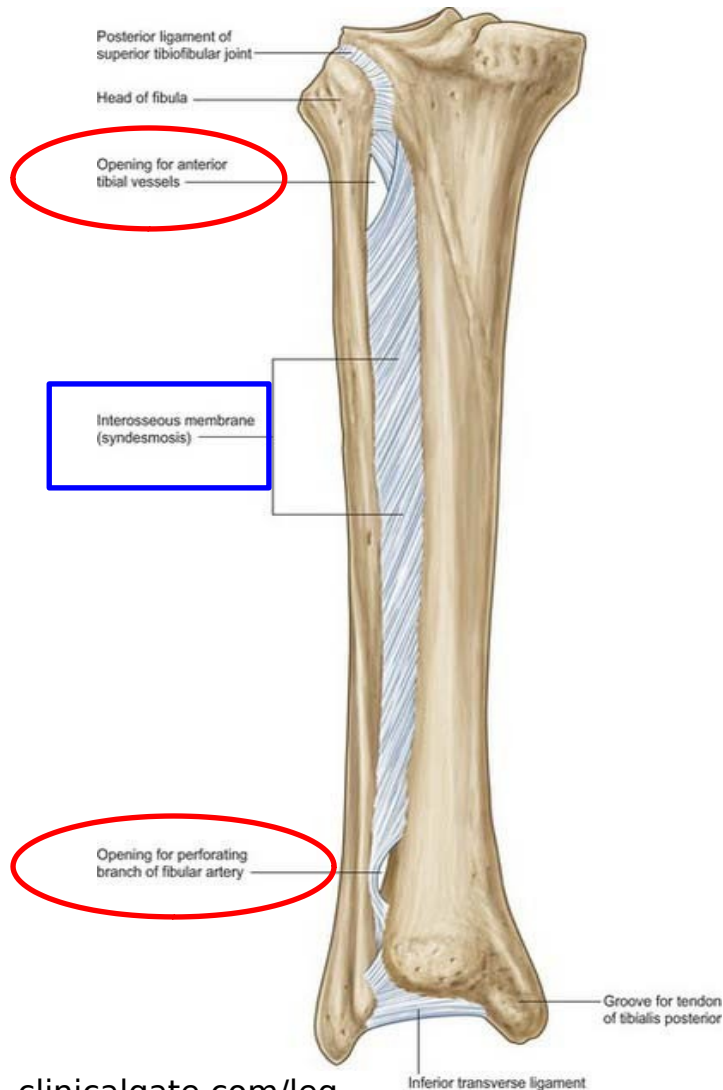
Character	Superior T/F joint	Inferior T/F joint
-Type:	-Plane synovial.	-fibrous (syndesmosis).
-Articular surfaces:	-Fibular facet of tibia. -Articular facet of head of fibula.	-Fibular notch of lower end of tibia. -Medial surface of lower end of fibula.
-Capsule:	-Surrounds the margins of articular surfaces.	-Surrounds the margins of articular surfaces.
-Ligaments:	Anterior & posterior T/F.	-Interosseous T/F. -Anterior & posterior T/F. -Inferior transverse T/F (the inferior & deep part of posterior T/F ligament).
-Nerve supply:	-Nerve to popliteus. -Recurrent genicular nerve.	-Deep peroneal nerve -Tibial nerve.
-Blood supply:	-Anterior tibial recurrent artery. -Posterior tibial recurrent artery.	-Perforating branch of peroneal artery. -Malleolar arteries.

iddle = Interosseous membrane



- It is a tough fibrous sheet of connective tissue
- extends from the interosseous border of shafts of tibia and fibula
- It runs obliquely downwards and laterally

Middle = Interosseous membrane



clinicalgate.com/leg

❑ Openings in the interosseous membrane:

upper one for the passage of the anterior tibial vessels.

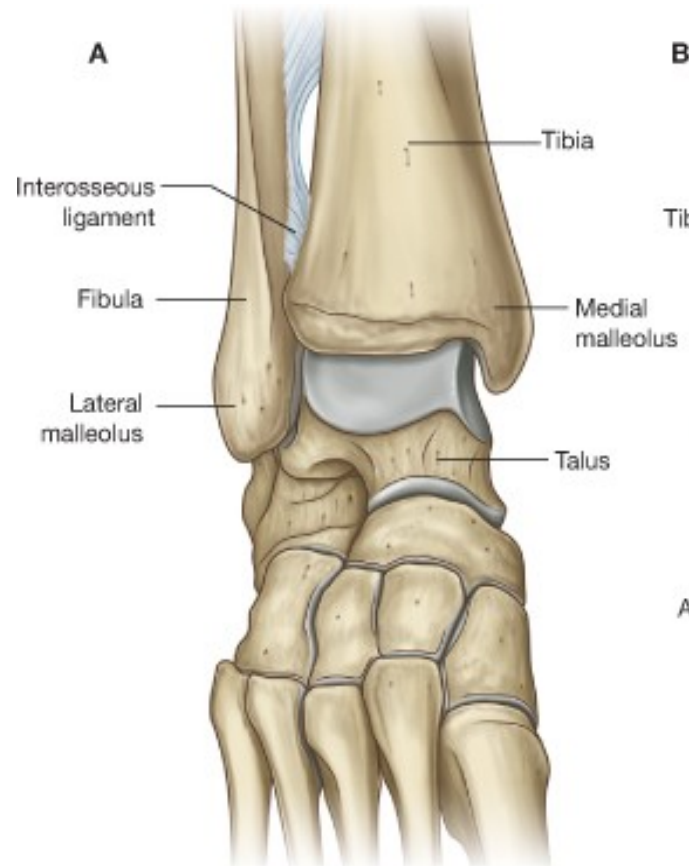
❑ Functions of middle T/F joint:

- a-Binds tibia to fibula.
- b-Gives additional surfaces for muscle attachment.
- c-Resists downward pull exerted on fibula by strong

Ankle Joint



- Type:
Synovial-hinge.



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Ankle Joint



Articular surfaces:

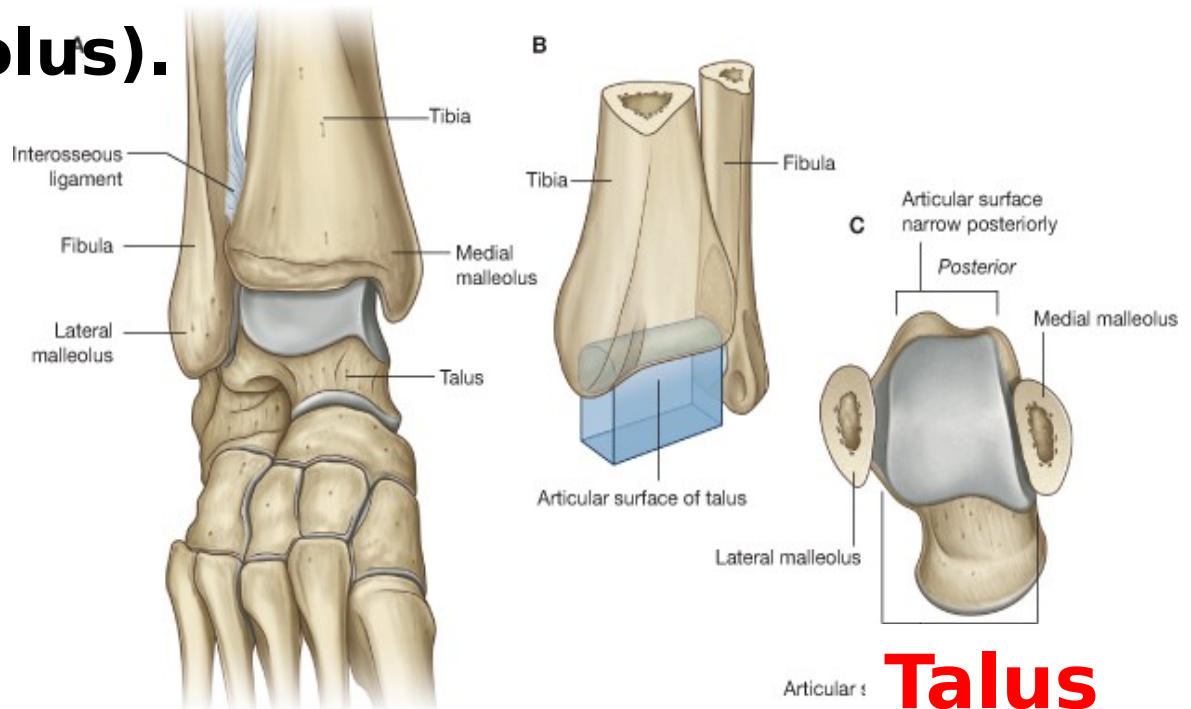
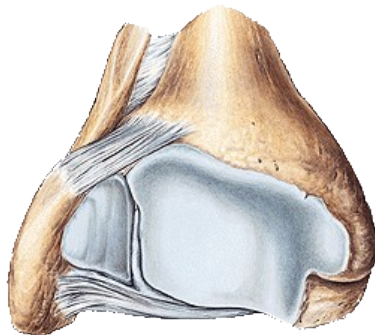
1- **Tibia**

(Inferior Surface of lower end+ medial malleolus).

2- **Fibula**

(lateral malleolus).

3- **Talus**



Talus

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Ankle Joint

- **Type:** synovial joint of hinge variety (uni-axial)
- **Articular surfaces:**
 - Superiorly: Formed by a deep socket including: lower end of the tibia and its medial malleolus, articular surface of the lateral malleolus of fibula and the inferior transverse tibiofibular ligament which deepens the socket posteriorly.
 - Inferiorly: Formed by articular surfaces of talus that includes; the superior (trochlear) surface, the medial (comma-shaped) surface & the lateral (triangular) surface.

Ankle Joint



Capsule of ankle joint

- The fibrous capsule covers the synovial membrane and is attached around the margins of the articular surfaces to the bones
- articular cavity is also enclosed by a synovial membrane



Atlas of Human Anatomy 6th Edition

Ankle Joint



Ligaments



**Medial
(deltoid)
ligament**



**Lateral
Ligamen
ts**

Ankle Joint



Medial (deltoid) ligament

Is Δ in shape with its

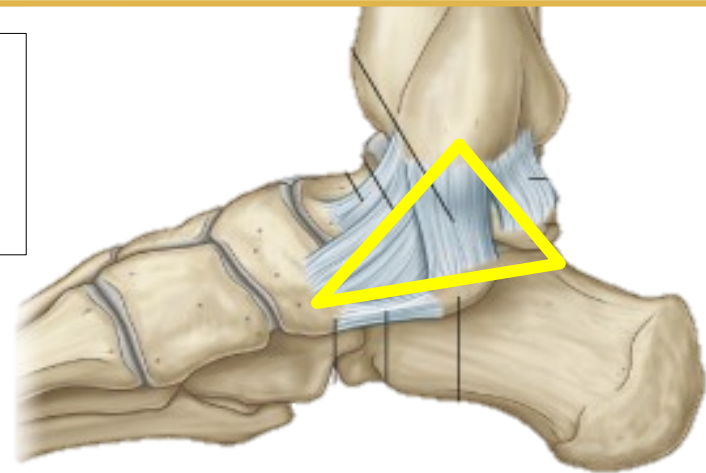
a. Apex: att. to tip of med. malleolus.

b. Base: att. to:

I. Tuberosity of navicular.

II. Sustentaculum tali.

III. Talus (body)



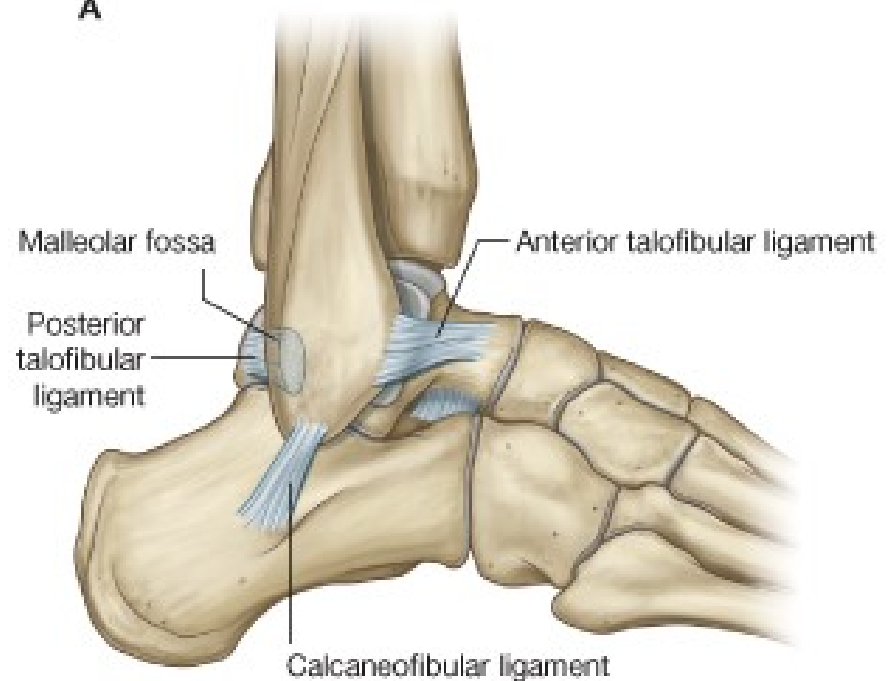
Ankle Joint



1. Anterior talofibular lig. 2. Posterior talofibular lig.

lateral ligament

A



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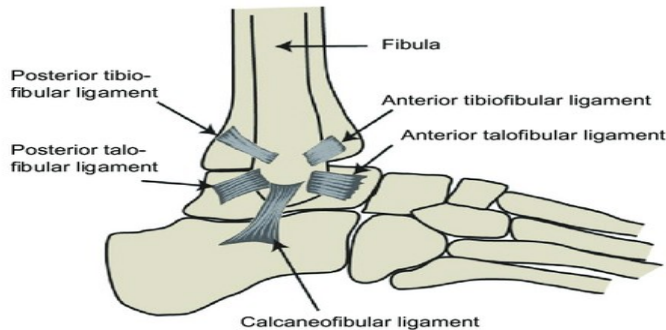
Ankle Joint



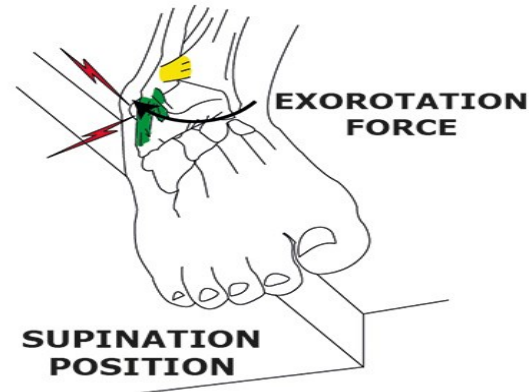
Sprain (torn fibers) of the lateral ligament of the ankle joint:

- ✓ Is the most common injury at the ankle because the lateral ligament is much weaker than the medial ligament.
- ✓ It is caused by excessive inversion of the foot with plantar flexion of the ankle due to stepping on an uneven surface

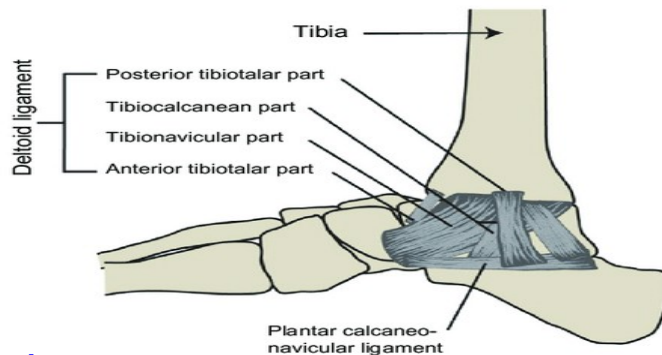
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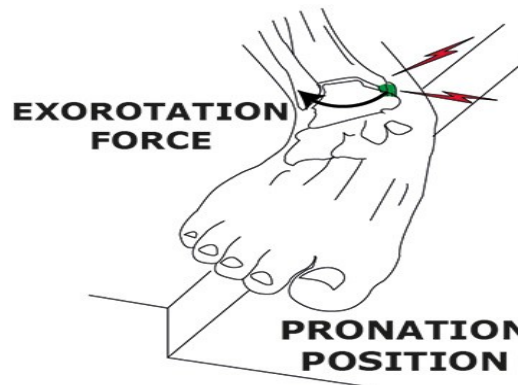
B



C



D



Ankle Joint

Medial (deltoid) ligament: (very strong and triangular in shape)

Attachments :

Above: its apex is attached to the tip & anterior and posterior borders of medial malleolus.

Below: its broad base is attached to the following structures from before backwards; tuberosity of navicular bone, plantar calcaneo-navicular (spring) ligament, sustentaculum tali and medial side of the talus.

2) Lateral ligament: It consists of 3 bands.

Anterior talofibular ligament: connects the anterior border of the lateral malleolus with the neck of the talus.

Posterior talofibular ligament: connects the malleolar fossa of the fibula with the lateral tubercle of the posterior process of the talus.

Calcaneo-fibular ligament: connects the apex of

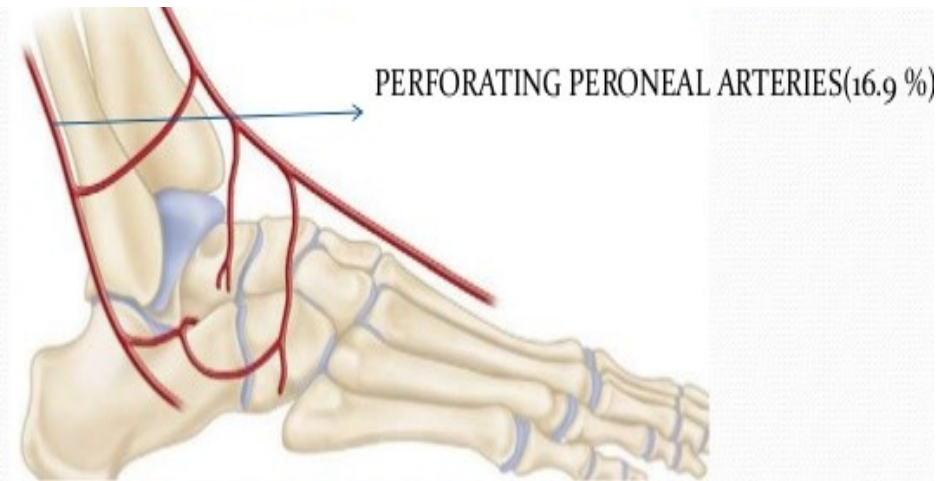
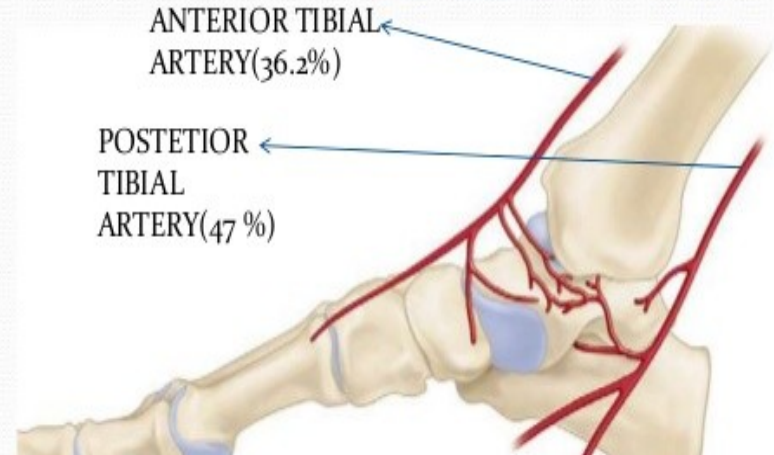
Blood supply of ankle joint



Blood supply of ankle joint:

It receives blood supply from malleolar branches of

1. anterior tibial artery
2. posterior tibial artery
3. peroneal artery.

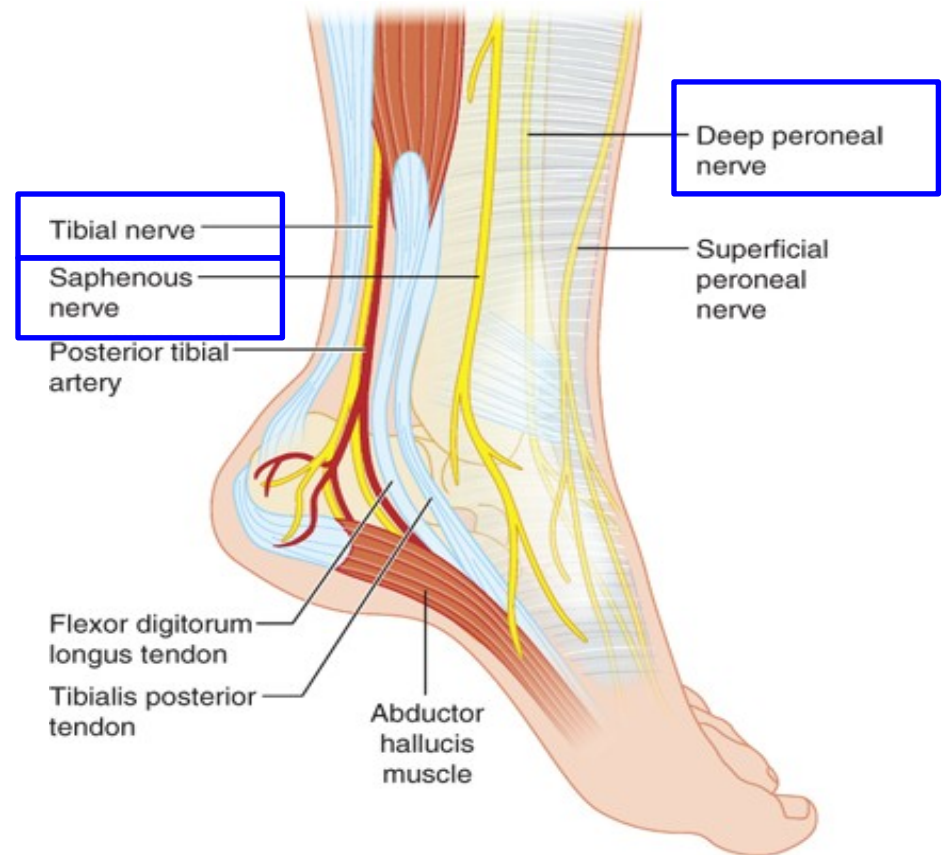


Nerve supply of ankle joint



The ankle joint receives its nerve supply from

1. deep peroneal nerve
2. Saphenous nerve
3. Tibial nerve



Source: J.E. Tintinalli, J.S. Stapczynski, O.J. Ma, D.M. Yealy, G.D. Meckler, D.M. Cline
Tintinalli's Emergency Medicine: A Comprehensive Study Guide, 8th Edition
www.accessmedicine.com
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Movements of Ankle Joint :



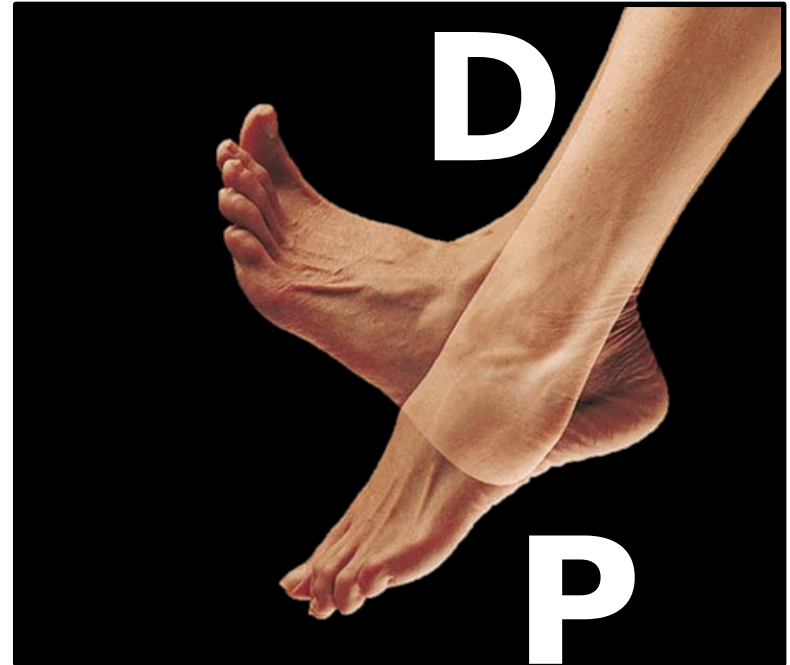
1- Dorsiflexion:

Muscles of the **anterior** compartments of the leg

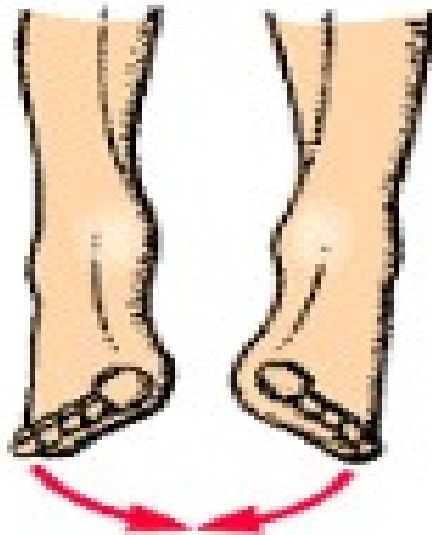
2- Plantar flexion:

Muscles of the **posterior & lateral** compartments of the leg

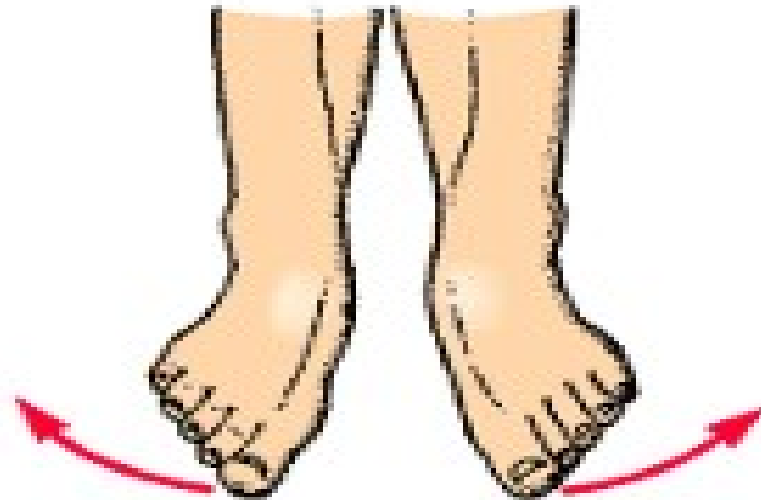
(**the ankle J. is locked in dorsiflexion** as the wider ant. border of the trochlear surface of talus becomes lodged in the socket).



Movements of Ankle Joint :



inversion of foot



eversion of foot

Inversion & eversion are **NOT** done in the **ANKLE Joint**

Inversion & eversion are done in **Talo-calcaneo-navicular J.**

Movements of Ankle Joint :

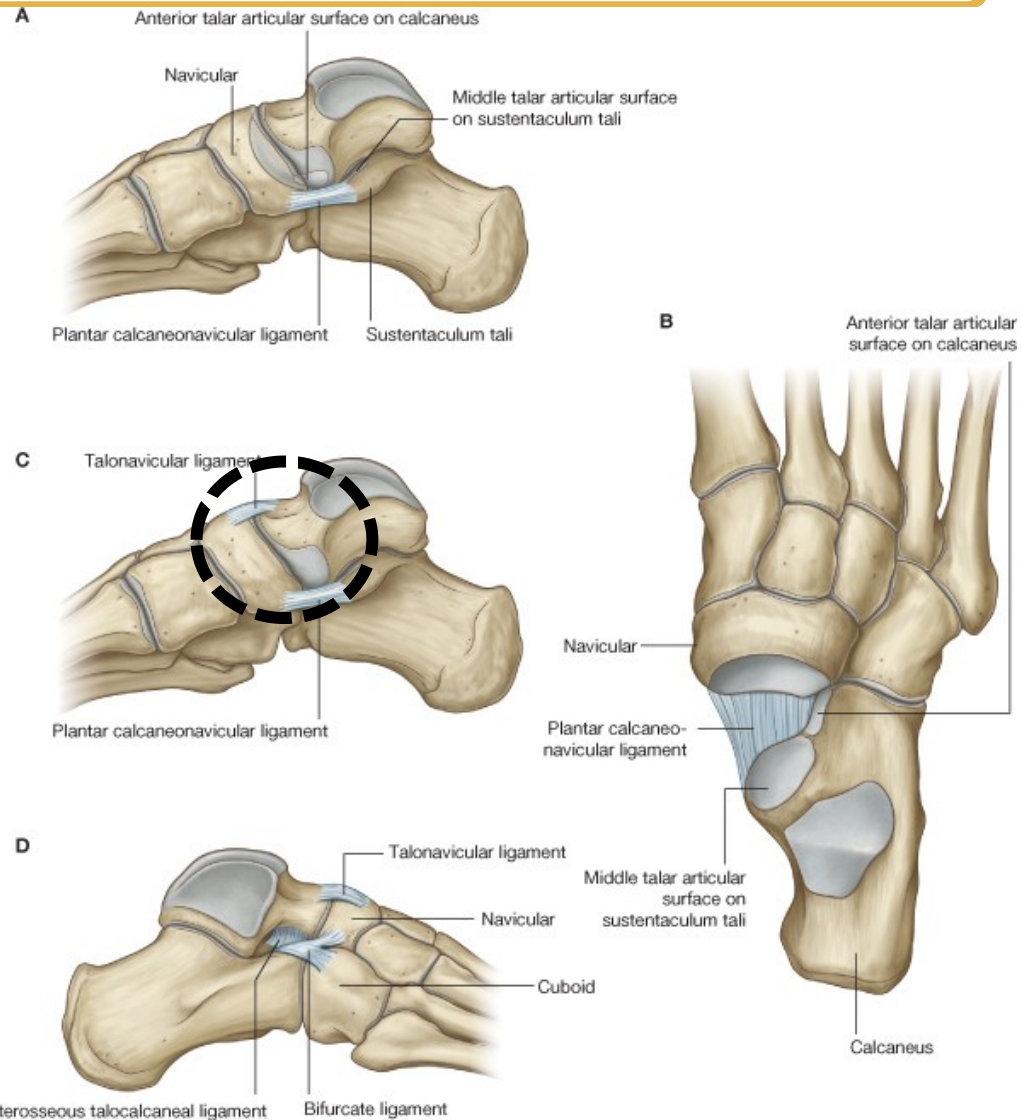
- **Dorsiflexion:** by tibialis anterior, extensor digitorum longus, extensor hallucis longus & peroneus tertius.
- The ankle joint is locked in dorsiflexion because the wider anterior part of the trochlear surface of the talus occupies the narrower posterior part of the tibiofibular socket.
- **Plantar flexion:** By superficial calf muscles (gastrocnemius, soleus & plantaris) and By deep calf muscles (tibialis posterior, flexor digitorum longus & flexor hallucis longus).

Talo-calcaneo-navicular joint

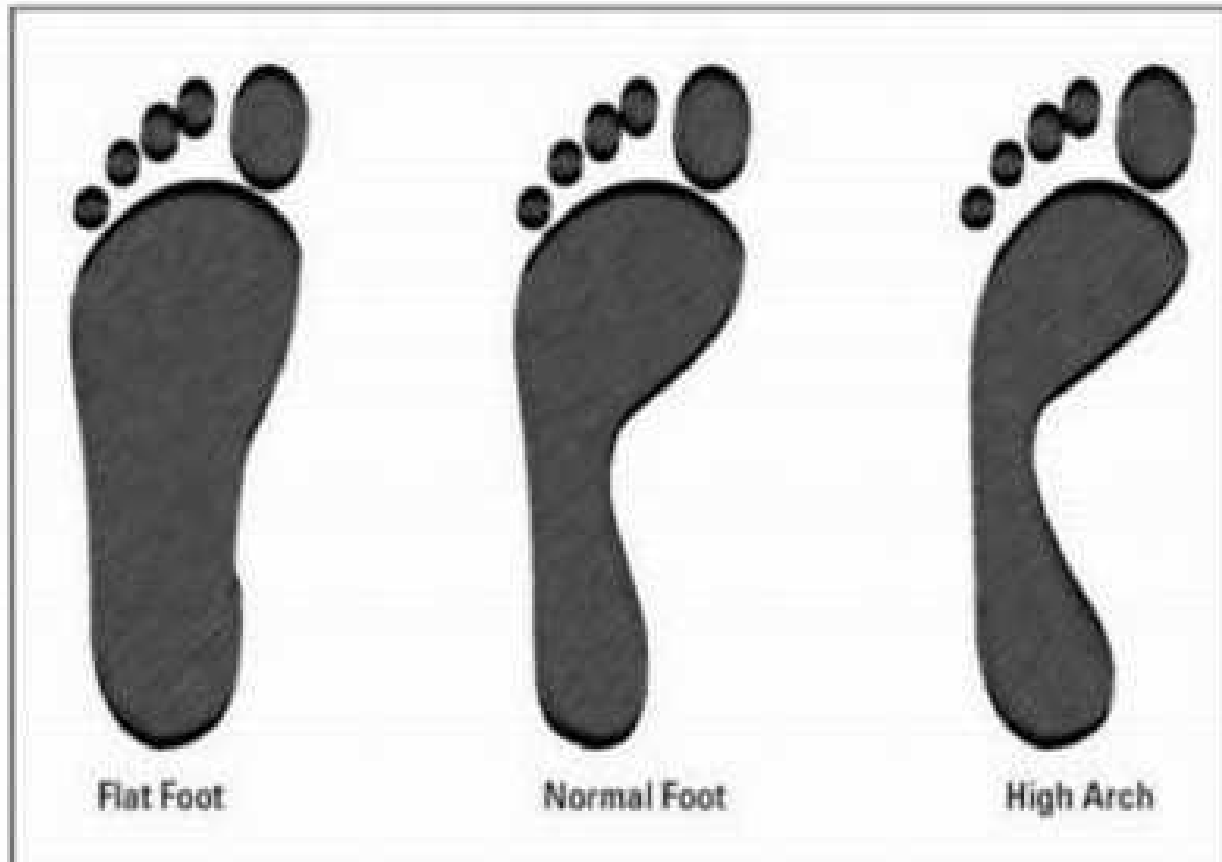


Type: synovial
ball & socket

The supporting ligaments:
plantar calcaneo-navicular
= spring ligament



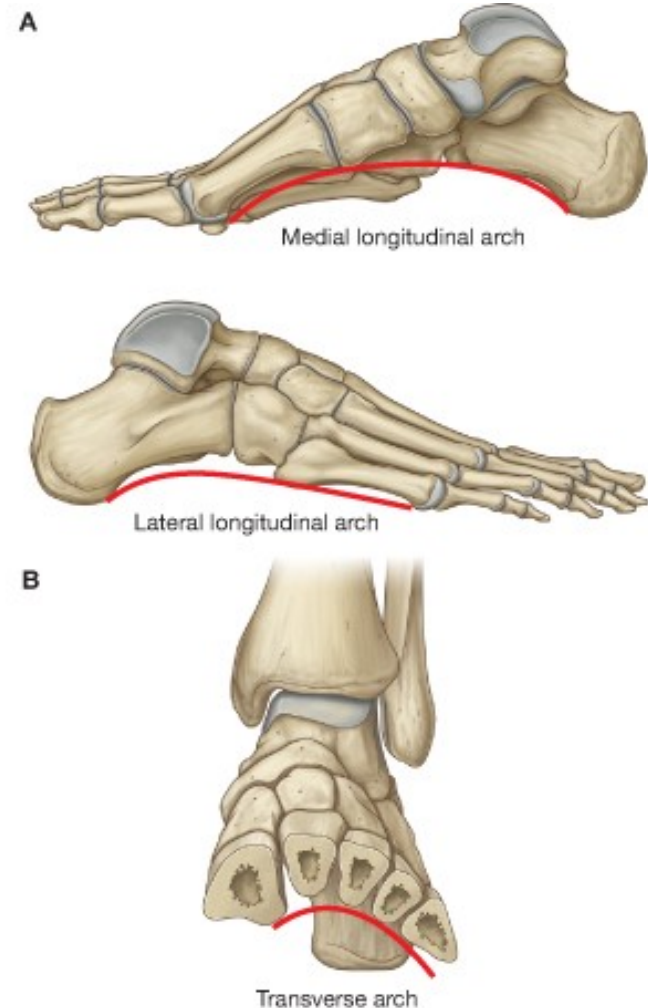
Arches of the foot



Arches of the foot



- **Medial (longitudinal) arch**
- **lateral (longitudinal) arch**
- **Transverse arch**

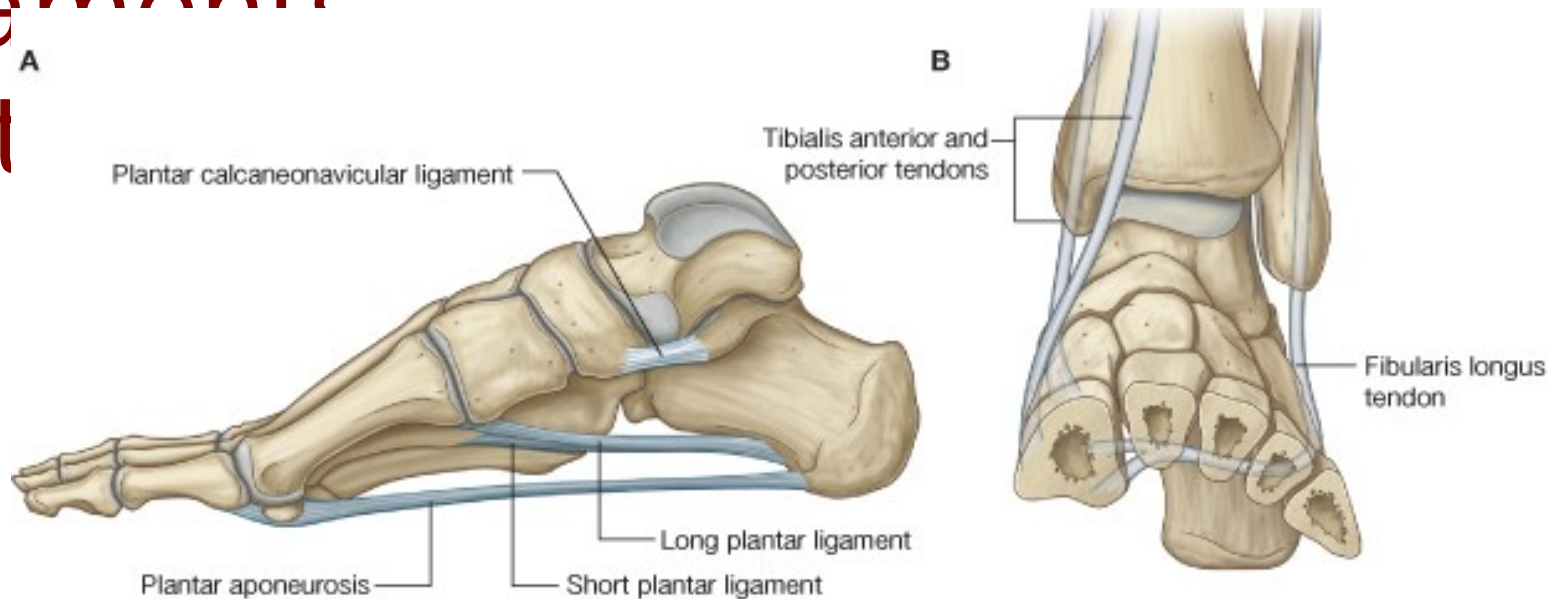


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Arches of the foot



- the shape of the articulating bones
- strengthened by the ligaments



Arches of the foot



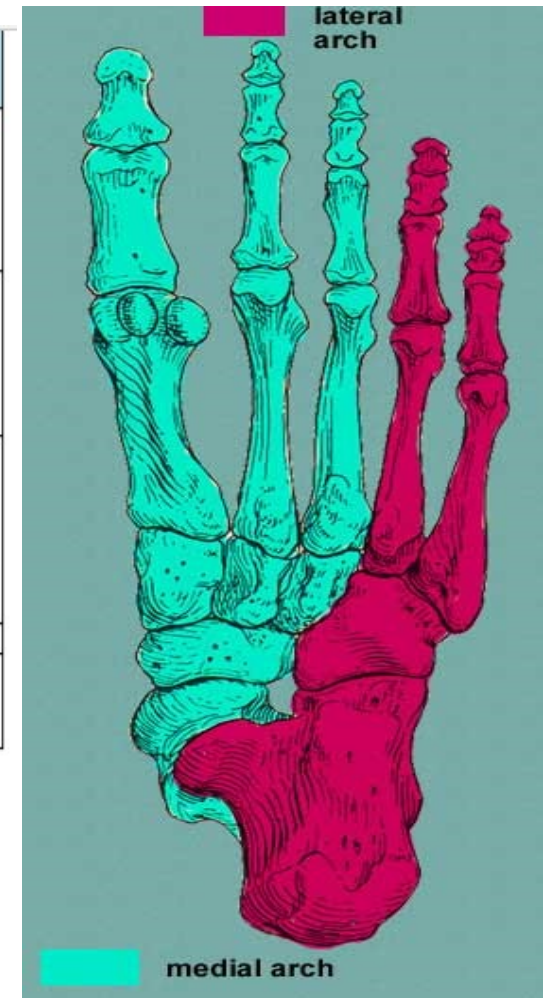
Functions of the arches:

- 1- Transmit the weight to the ground.
- 2- Give the foot elasticity during movement.
- 3- Absorption of shocks.
- 4- Protects the blood vessels and nerves from being crushed under body weight.

Longitudinal arch



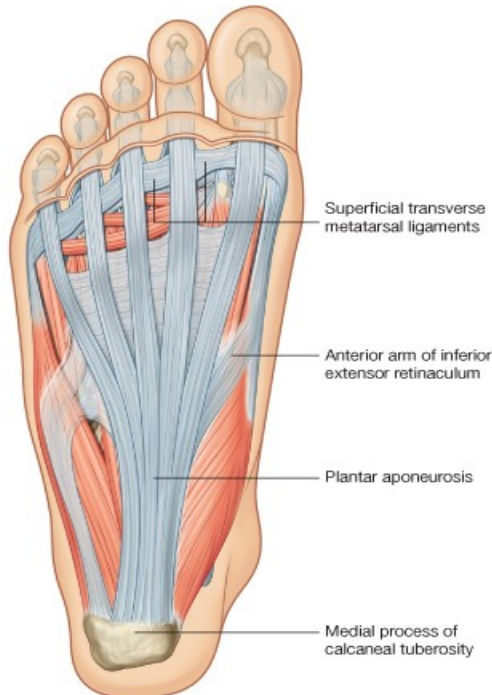
	Medial longitudinal arch	Lateral longitudinal arch
General notes	-highly arched - more mobile	- less arched - less mobile
Anterior pillar	navicular + 3 cuneiform + <i>medial 3</i> metatarsals	cuboid bone + lateral 2 metatarsals
Posterior pillar	<i>Calcaneum</i>	<i>Calcaneum</i>
Summit	<i>talus</i>	<i>talus</i>
Main function	shock absorber	transmits body weight to ground



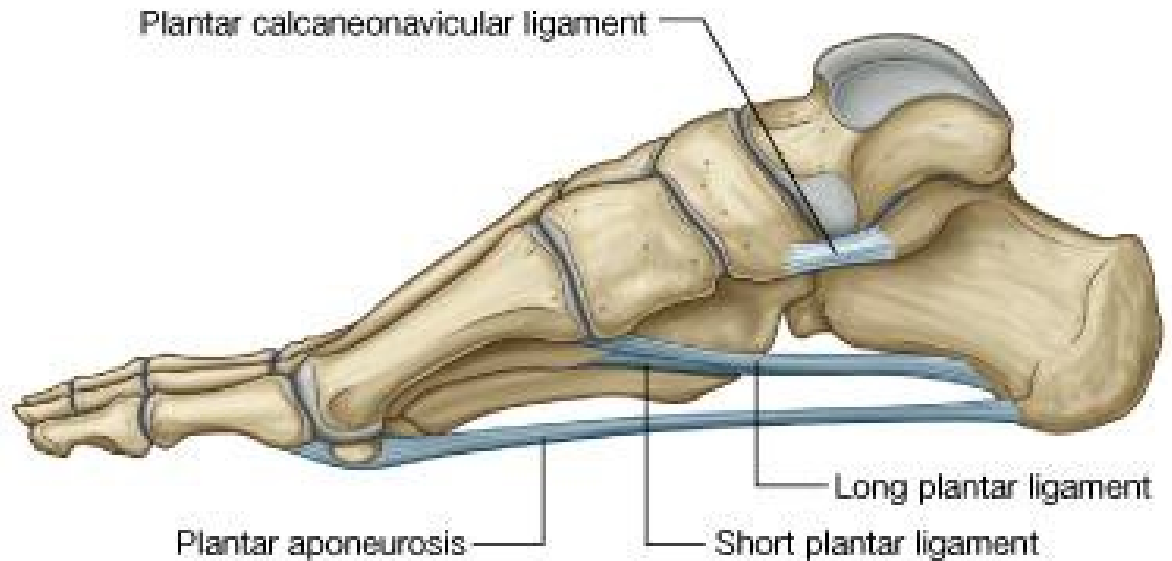
Longitudinal arch



	Medial longitudinal arch	Lateral longitudinal arch
Ligamentous support	spring ligament + plantar aponeurosis (medial ½)	long and short plantar ligaments + plantar aponeurosis (lat ½)



(Spring ligament)



Longitudinal arch

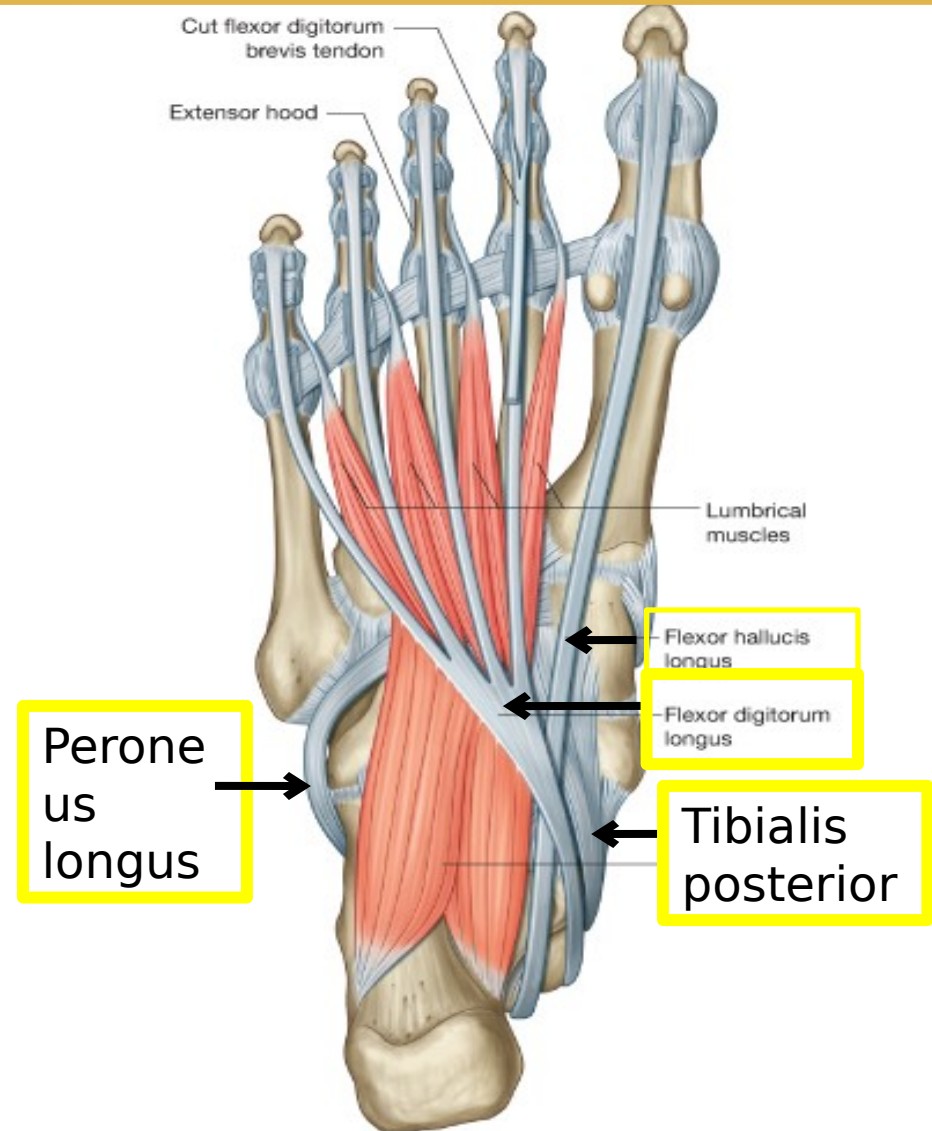


Medial longitudinal arch

Tendons of flexor hallucis longus, flexor digitorum longus & tibialis posterior +

Lateral longitudinal arch

Tendon of peroneus longus + intrinsic muscle of little toe (abductor digiti minimi).



Transverse arch



It is primarily formed by the 5

-metatarsal bones.

1- Peroneus longus muscle

2- Transverse head of adductor hallucis



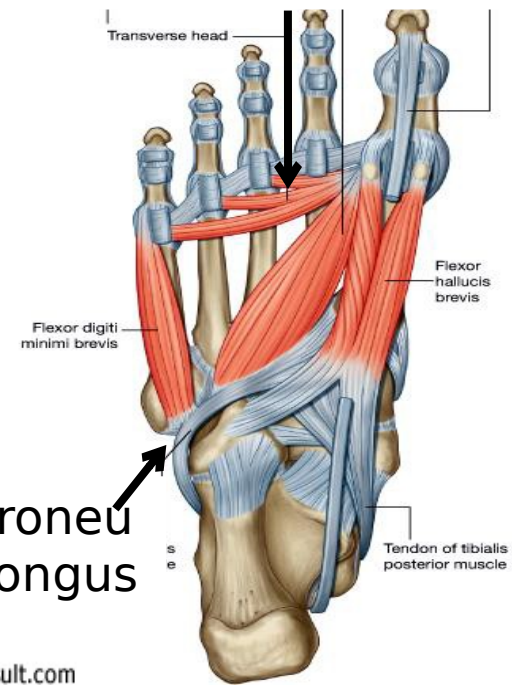
Transverse arch



Tibialis anterior and posterior tendons

Peroneus longus

adductor hallucis



Peroneus longus

Effects of flat foot



- 1. Compression of nerves & vessels of the sole □ severe pain**
- 2. Loss of shock absorbing function □ foot becomes more liable to trauma**
- 3. Loss of spring in the foot □ shuffling gait**

Lecture Quiz



Question 1

a) Mention different movements occurs at ankle joint

b) Describe arches of foot regarding bone forming them and supporting ligaments

SUGGESTED TEXTBOOKS



Clinical Anatomy by Regions, 9th edition,
2011, Snell RS, Lippincott, Williams and
Wilkins

Atlas of Human Anatomy, 6th edition,
2014, Netter F.H.

Gray's Anatomy for students, 2nd edition,
2011, Drake R. et al, Churchill & Livingstone